

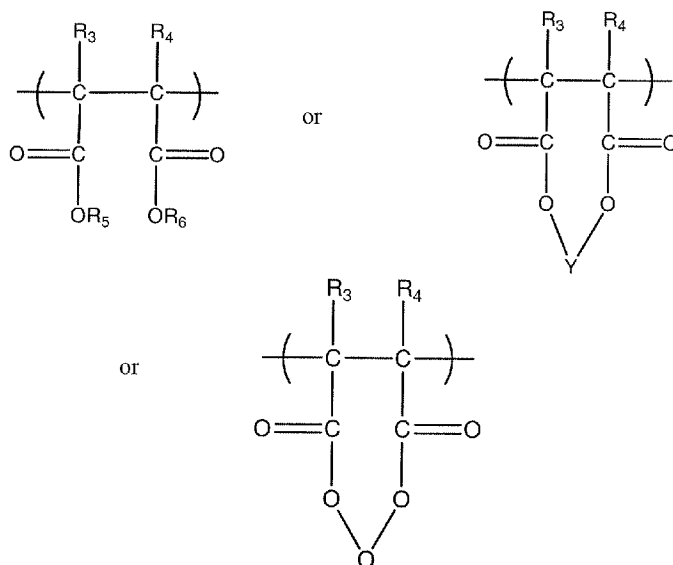
Claims

- [c1] 1.A method of decreasing nitrogen volatilization comprising the step of coating a fertilizer product with a polymer to form a coated fertilizer product, said fertilizer product being selected from the group consisting of phosphate-based fertilizers, organic wastes, waste waters, fertilizers containing nitrogen, phosphorous, potassium calcium, magnesium, sulfur, boron, or molybdenum materials, fertilizers containing micronutrients, and oxides, sulfates, chlorides, and chelates of such micronutrients.
- [c2] 2.The method of claim 1, said polymer being 100% saturated with calcium.
- [c3] 3.The method of claim 1, said polymer being 50% saturated with hydrogen and 50% saturated with calcium.
- [c4] 4.The method of claim 1, said polymer including the salt form thereof.
- [c5] 5.The method of claim 1, said polymer coating comprising at least about 0.005% by weight of said coated fertilizer product.

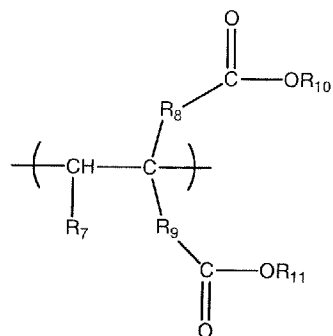
[c6] 6.The method of claim 1, said polymer coating comprising at least about 0.01% by weight of said coated fertilizer product.

[c7] 7.The method of claim 1, said polymer coating comprising at least about 0.5% by weight of said coated fertilizer product.

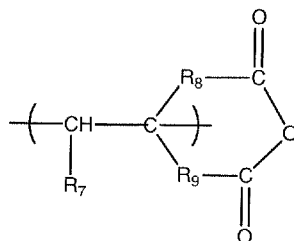
[c8] 8.The method of claim 1, said polymer comprising recurring polymeric subunits each made up of at least two different moieties individually and respectively taken from the group consisting of B, and C moieties, or recurring C moieties, where moiety B is of the general formula



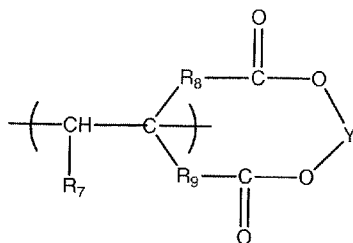
and moiety C is of the general formula



or



or



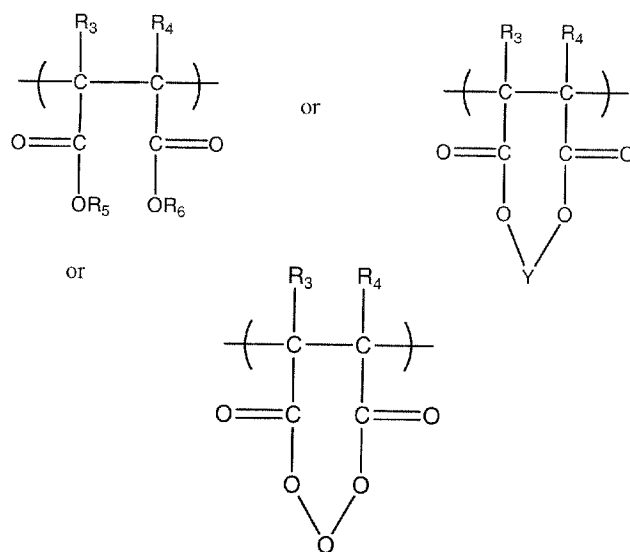
wherein each R_7 is individually and respectively selected from the group consisting of H, OH, $\text{C}_1\text{--C}_{30}$ straight, branched chain and cyclic alkyl or aryl groups, $\text{C}_1\text{--C}_{30}$ straight, branched chain and cyclic alkyl or aryl based ester groups, $\text{R}'\text{CO}_2$ groups, OR' groups and COOX groups, wherein R' is selected from the group consisting of $\text{C}_1\text{--C}_{30}$ straight, branched chain and cyclic alkyl or aryl groups and X is selected from the group consisting of H, the alkali metals, NH_4 and the $\text{C}_1\text{--C}_4$ alkyl ammonium groups, R_3 and R_4 are individually and respectively selected from the group consisting of H, $\text{C}_1\text{--C}_{30}$ straight, branched chain and cyclic alkyl or aryl groups, R_5 , R_6 , R_{10} and R_{11} are individually and respectively selected from

the group consisting of H, the alkali metals, NH_4 and the $\text{C}_1\text{--C}_4$ alkyl ammonium groups, Y is selected from the group consisting of Fe, Mn, Mg, Zn, Cu, Ni, Co, Mo, V and Ca, and R_8 and R_9 are individually and respectively selected from the group consisting of nothing (i.e., the groups are non-existent), CH_2 , C_2H_4 , and C_3H_6 , each of said moieties having or being modified to have a total of two COO groups therein.

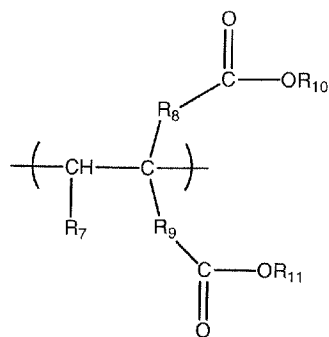
- [c9] 9.A method of increasing phosphorus availability comprising the step of applying to the soil adjacent growing plants a fertilizer product coated with a substantially water-soluble polymer, said fertilizer product being selected from the group consisting of phosphate-based fertilizers, organic wastes, waste waters, fertilizers containing nitrogen, phosphorous, potassium calcium, magnesium, sulfur, boron, or molybdenum materials, fertilizers containing micronutrients, and oxides, sulfates, chlorides, and chelates of such micronutrients.
- [c10] 10.The method of claim 9, said fertilizer product being applied at a rate of at least about 5 ppm.
- [c11] 11.The method of claim 9, said fertilizer product being applied at a rate of at least about 10 ppm.
- [c12] 12.The method of claim 9, said fertilizer product being

applied at a rate of at least about 20 ppm.

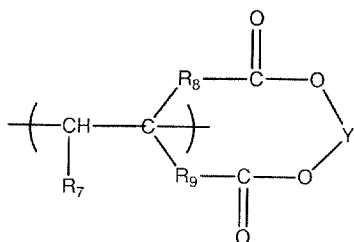
- [c13] 13. The method of claim 9, said polymer comprising recurring polymeric subunits each made up of at least two different moieties individually and respectively taken from the group consisting of B, and C moieties, or recurring C moieties, where moiety B is of the general formula



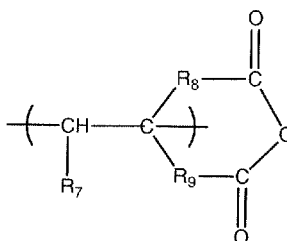
and moiety C is of the general formula



or



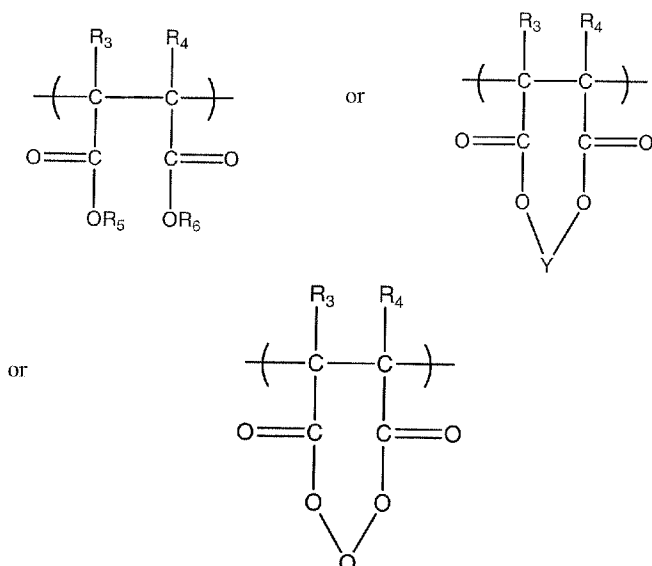
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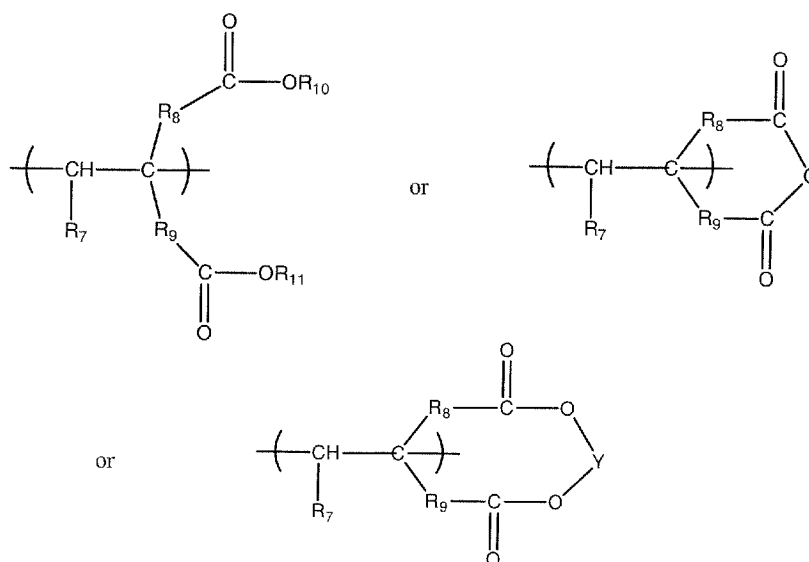
wherein each R_7 is individually and respectively selected from the group consisting of H, OH, C_1-C_{30} straight, branched chain and cyclic alkyl or aryl groups, C_1-C_{30} straight, branched chain and cyclic alkyl or aryl based ester groups, $\text{R}'\text{CO}_2$ groups, OR' groups and COOX groups, wherein R' is selected from the group consisting of C_1-C_{30} straight, branched chain and cyclic alkyl or aryl groups and X is selected from the group consisting of H, the alkali metals, NH_4 and the C_1-C_4 alkyl ammonium groups, R_3 and R_4 are individually and respectively selected from the group consisting of H, C_1-C_{30} straight, branched chain and cyclic alkyl or aryl groups, R_5 , R_6 , R_{10} and R_{11} are individually and respectively selected from

the group consisting of H, the alkali metals, NH_4 and the $\text{C}_1\text{--C}_4$ alkyl ammonium groups, Y is selected from the group consisting of Fe, Mn, Mg, Zn, Cu, Ni, Co, Mo, V and Ca, and R_8 and R_9 are individually and respectively selected from the group consisting of nothing (i.e., the groups are non-existent), CH_2 , C_2H_4 , and C_3H_6 , each of said moieties having or being modified to have a total of two COO groups therein.

- [c14] 14.A method of decreasing fertilizer dust comprising the step of coating a fertilizer selected from the group consisting of said fertilizer being selected from the group consisting of phosphate-based fertilizers, organic wastes, waste waters, fertilizers containing nitrogen, phosphorous, potassium calcium, magnesium, sulfur, boron, or molybdenum materials, fertilizers containing micronutrients, and oxides, sulfates, chlorides, and chelates of such micronutrients with comprising recurring polymeric subunits each made up of at least two different moieties individually and respectively taken from the group consisting of B, and C moieties, or recurring C moieties, where moiety B is of the general formula



and moiety C is of the general formula



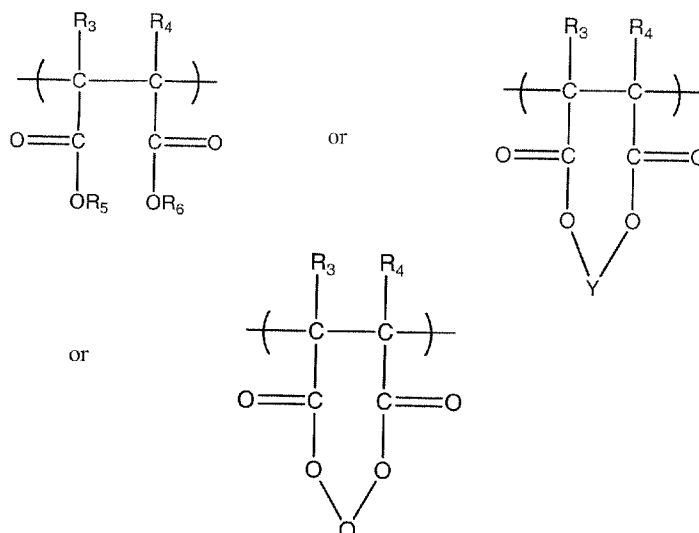
wherein each R_7 is individually and respectively selected from the group consisting of H, OH, $\text{C}_1\text{--C}_{30}$ straight, branched chain and cyclic alkyl or aryl groups, $\text{C}_1\text{--C}_{30}$ straight, branched chain and cyclic alkyl or aryl based ester groups, $\text{R}'\text{CO}_2$ groups, OR' groups and COOX groups, wherein R' is selected from the group consisting of $\text{C}_1\text{--C}_{30}$ straight, branched chain and cyclic alkyl or aryl groups and X is selected from the group consisting of H,

the alkali metals, NH_4 and the $\text{C}_1\text{--C}_4$ alkyl ammonium groups, R_3 and R_4 are individually and respectively selected from the group consisting of H, $\text{C}_1\text{--C}_{30}$ straight, branched chain and cyclic alkyl or aryl groups, R_5 , R_6 , R_{10} and R_{11} are individually and respectively selected from the group consisting of H, the alkali metals, NH_4 and the $\text{C}_1\text{--C}_4$ alkyl ammonium groups, Y is selected from the group consisting of Fe, Mn, Mg, Zn, Cu, Ni, Co, Mo, V and Ca, and R_8 and R_9 are individually and respectively selected from the group consisting of nothing (i.e., the groups are non-existent), CH_2 , C_2H_4 , and C_3H_6 , each of said moieties having or being modified to have a total of two COO groups therein.

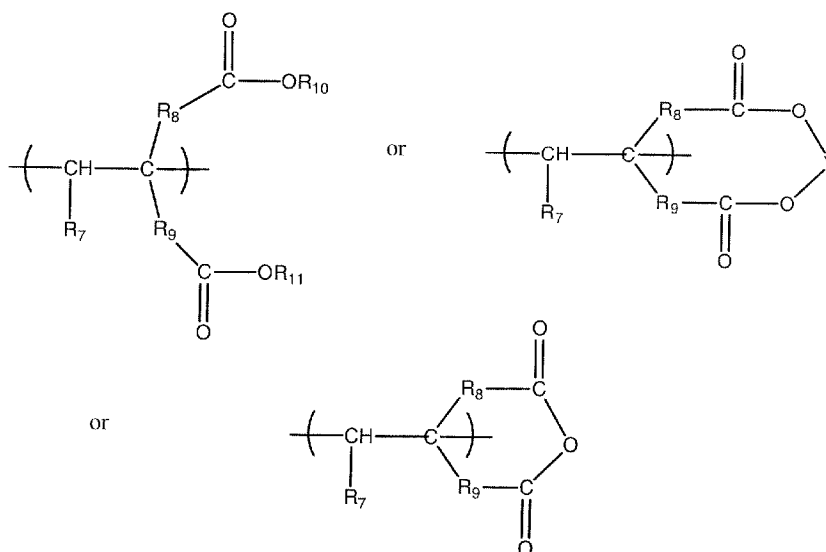
[c15] 15.The method of claim 14, said polymer coating being at a level of at least about 0.005% w/w.

[c16] 16.A method of decreasing fertilizer dust comprising the step of coating fertilizer with a dicarboxylic acid polymer composition, said fertilizer being selected from the group consisting of said fertilizer being selected from the group consisting of phosphate-based fertilizers, organic wastes, waste waters, fertilizers containing nitrogen, phosphorous, potassium calcium, magnesium, sulfur, boron, or molybdenum materials, fertilizers containing micronutrients, and oxides, sulfates, chlorides, and chelates of such micronutrients, said polymer having re-

curing polymeric subunits each made up of at least two different moieties individually and respectively taken from the group consisting of B and C moieties, or recurring C moieties, wherein moiety B is of the general formula



and moiety C is of the general formula



wherein each R_7 is individually and respectively selected from the group consisting of H, OH, $\text{C}_1\text{--C}_{30}$ straight, branched chain and cyclic alkyl or aryl groups, $\text{C}_1\text{--C}_{30}$

straight, branched chain and cyclic alkyl or aryl based ester groups, $R'CO_2$ groups, OR' groups and $COOX$ groups, wherein R' is selected from the group consisting of C_1-C_{30} straight, branched chain and cyclic alkyl or aryl groups and X is selected from the group consisting of H , the alkali metals, NH_4 and the C_1-C_4 alkyl ammonium groups, R_3 and R_4 are individually and respectively selected from the group consisting of H , C_1-C_{30} straight, branched chain and cyclic alkyl or aryl groups, R_5 , R_6 , R_{10} and R_{11} are individually and respectively selected from the group consisting of H , the alkali metals, NH_4 and the C_1-C_4 alkyl ammonium groups, Y is selected from the group consisting of Fe , Mn , Mg , Zn , Cu , Ni , Co , Mo , V and Ca , and R_8 and R_9 are individually and respectively selected from the group consisting of nothing (i.e., the groups are non-existent), CH_2 , C_2H_4 , and C_3H_6 , each of said moieties having or being modified to have a total of two COO groups therein.

[c17] 17.The method of claim 16, said polymer comprising at least about 0.005% by weight of said coated fertilizer.

[c18] 18.The method of claim 16, said polymer comprising at least about 0.01% by weight of said coated fertilizer.